

# SCIENCE

NEW YORK, SEPTEMBER 11, 1891.

## THE CURE OF CONSUMPTION.<sup>1</sup>

No words of mine are required to impress upon you the great importance of this subject, to express the intense interest that is universally taken in it, or to point out the far-reaching influence its public establishment will have upon scientific investigation. But it is, perhaps, necessary for me to say that I fully recognize the grave responsibility that rests upon any one who makes the statements I am about to make, and that I am completely justified in accepting that responsibility. Perhaps it may be within the recollection of some of those present that at the Birmingham and Manchester meetings of the association in 1886-87 I read papers giving the results of a series of investigations on consumption and chest types. I showed in the former paper that consumption was directly produced by the conditions that tend to reduce the breathing capacity below a certain point in proportion to the remainder of the body, and contended that it could be both prevented and completely recovered from by the adoption of measures that were based upon that interpretation of its nature. In the latter I adduced evidence that proved that the size and shape of the chest after birth solely depended upon the conditions to which it was subjected, that there was the same relationship between the size and shape of the other parts of the body and the conditions to which they were subjected, and that this law obtained in the animal and vegetable kingdoms. The research, as a whole, showed that there was a complete series of types that had on the one hand extreme consumption, and on the other the finest type of health, directly produced by the conditions to which they had been submitted. And I referred to the immense importance of the issues that were raised, both from a practical and scientific point of view.

At that time the evidence was mainly derived from experiments, although I had some most valuable and significant practical experience, and I found the general opinion was that it would be extremely difficult, if not impossible, to practically apply that knowledge. Since then, however, the practical evidence of the relationship between conditions and types of chest has been irrefutably established at the Polytechnic. By the application of that knowledge in the ordinary routine of daily life, the members of the Polytechnic Physical Development Society, although engaged for many hours daily in all sorts of trades and occupations, some of them under very unfavorable conditions, have shown how greatly the chest girth, its range of movement, the vital capacity, and the power of inspiration and expiration can be increased. Last year, at Leeds, I gave the measurements of one hundred members. If you will refer to the report you will find the average increase of the chest girth was  $1\frac{3}{4}$  inches, that of the third class being  $1\frac{1}{4}$  inches, the second  $2\frac{1}{8}$  inches, and the first class  $3\frac{3}{8}$  inches. At a subsequent examination for the society's gold medals and certificates the first three

members had obtained an increase of  $6\frac{1}{2}$ , 5, and  $4\frac{3}{8}$  respectively, and although some of our best members are constantly leaving the Polytechnic, and new ones joining us, I am glad to say there has been a further average increase of one-quarter of an inch in all classes. Many of the members are engaged in the trades that have a high rate of mortality from consumption, and not a few of them would have long been in the ranks of the consumptives had it not been for the efficacy of the directions given them by the society,—that is to say, the practicability and certainty of the measures that are necessary to secure the prevention of consumption have been fully demonstrated.

Whilst one part of the work has been practically applied at the Polytechnic, the practical application of the other has been equally successful in the amelioration and, where the disease was not too extensive, the cure of consumption. I cannot enter into medical details here, but I may state that by the cure of consumption I mean the possession and appearance of sound health, natural breathing from base to apex, a well-formed and fairly developed chest, a good range of movement, and vital capacity that have stood at least a twelve months' test. The cases that were referred to at Manchester in 1887 as having completely recovered remain well, and those that have subsequently recovered went through last winter without giving the slightest indication of a relapse. There has been no relapse in any of these cases of cure, and no failure. Up to the present the mortality of all the cases has been under ten per cent, and has been limited to those who were most extensively diseased, and who were, in fact, *in extremis*. There are others who have derived great benefit, and some of them will ere long take their places in the ranks of the cured. One of the latter has stolen a march upon me. He presented himself for life assurance, was accepted as a first-class life, and obtained a reduction in his premium. He is unquestionably well, but he would not allow me my twelve months' test. There is not a sufficient number of cases to compare with the statistics obtained at the Polytechnic, but I may say the increase in the chest girth ranges from  $1\frac{1}{2}$  inches to over 4 inches. We have chest girths of over 38 and 39 inches, the range of movement varies from 3 to 6 inches, and the vital capacity greatly exceeds in some cases Hutchinson's standard of health.

I have now shown you that the results that had been experimentally obtained have also been equally well obtained in the practical application of that research, that each part of the investigation confirms the other, and that they together form a complete and harmonious whole. Consequently I have also shown you that we now have before us and within our grasp the real cure for consumption, that we can effectually prevent its production, and that by united and continuous action in both directions we can, ere long, practically remove this curse of civilization from our midst.

What steps are to be taken to secure the great benefits of this advance in knowledge? Let me, in the first place, remind you that consumption is a disease of civilization, a part of the process of evolution by which an adjustment is made between the body and the work it has to perform under the ever-changing conditions of advancing civilization, by the re-

<sup>1</sup> An address by Godfrey W. Hambleton, M.D., president of the Polytechnic Physical Development Society, at the meeting of the British Association for the Advancement of Science, Cardiff, August, 1891.

moval of those who have a body incapable of that work, and that it is directly produced by the habits and surroundings that tend to reduce the breathing capacity below a certain point in proportion to the remainder of the body. Obviously, the first thing that has to be done is to prevent the production of this disease, and for that purpose we must see that the body is used to the extent its size demands, and that the work it has to perform is carried on under conditions that are favorable to the body, — that is to say, we must so arrange our habits and surroundings that their tendency as a whole is to develop the lungs. Each act of man, each factor in his environment, tends either in his favor or against him. We must avoid as far as possible — and where that is not practicable we must counteract their action — those that tend to reduce the breathing capacity. Close, badly-ventilated, or hot rooms, the inhalation of any kind of dust, the habit of taking small quantities of alcohol (termed “nipping”), stooping, positions that cramp or impede the full and free movement of the chest, the corset or tight-fitting clothes, overloading the body with clothes, etc., are examples of such conditions. And we must place ourselves as far as possible under the conditions that tend to develop the lungs. We should spend as much time as possible in some form of active exercise in the open air, live in rooms that are in direct free communication with the external air night and day, summer and winter, and keep their temperature down. We ought to have the clothing quite easy over the chest at full inspiration, wear wool next the skin, take a tub daily, hold the body erect with the chest thrown well forward and the shoulders held well back, get into the habit of taking deep inspirations followed by full expirations, and breathe through the nose. And we should go in for singing, swimming, gymnastics, — Ling’s system by preference, — and for one or, better still, several forms of athletic sports, rise early, and maintain the temperature of the body by muscular exercise. I have briefly indicated the conditions that are favorable or unfavorable to lung development, and to that I will only add that measurements by the tape, the spirometer, and the manometer should be regularly taken, recorded, and compared with the standards that indicate a fully developed chest, and that it is the plain duty of each one of us to see that he stands well in that respect, for we can protect ourselves from the possibility of an attack of consumption by securing and maintaining a lung capacity far above the point at which the disease originates.

The second direction in which we must take action, if we mean to remove this curse of civilization from our midst, is to recognize early, and that promptly and adequately, those who have the great misfortune to be its victims. This is the state with which we have to deal here. The lungs are being progressively destroyed by a process of irritation caused by more work being thrown upon them than they are able to effect, and this inability has been produced by their having been and still being subject to conditions that tend to reduce their capacity; and, further, during the progress of these events, the other organs have become involved by attempting to perform compensatory work, with the result that the general health is more or less seriously compromised. Consequently, in order to adequately deal with this state of things, we must treat consumption upon the following principles: To establish an equilibrium between the amount of interchange required to be effected and that effected, to enable the other organs of the body to perform their ordinary functions, to restore to the lungs their power of adjustment to their external conditions, and to obtain the above without

producing indications of friction. That is, in other words, we must arrest this process of irritation, restore the general health, and develop the lungs to the required amount, in order to effect the cure of consumption. I will now briefly indicate the method of applying the principles above laid down. We must, to arrest this process of irritation, remove the conditions that impede the effecting of those interchanges by placing the patient under conditions that tend to develop the lungs, and make good any deficiency that may remain by causing compensatory action by one or more of the other organs. We shall proceed with measures for the restoration of the functions of any organ that may have been deranged, and when we have obtained the arrest of the disease and effected an improvement of the general health we shall begin to develop the lungs. We must carefully select appropriate medicines and measures for each purpose we have in view, use them at the right time and to the right extent, and watch their effects, so that if there be any indication of friction we may at once effect the necessary modification or use some other medicines or measures for that purpose.

It is easy to cure consumption at the commencement, even when both lungs are affected. It can be cured when there is a large amount of disease, and it may at least be ameliorated when both lungs are extensively diseased. I speak from practical experience, and I for one will not attempt to place a limit upon the great power of Nature when all her forces are called forth and aided.

The links of evidence slowly forged by men who have gone and by others still with us I have put together. Test the chain thus formed where and how you please, and you will find that it is complete and unbreakable. We have performed our part of this work, and in the name of those who have taken part therein I now call upon you to give effect to it by uniting together in the great work of suppressing consumption.

#### PROGRESS OF PREVENTIVE MEDICINE.<sup>1</sup>

UNPRECEDENTED progress in human knowledge characterizes the present century, and has not been wanting in preventive medicine. It is, however, during the last half of it that advance has been most remarkable, whilst it is in a later part of that period that it has so established itself in the popular mind as to have passed from the region of doubt and speculation into that of certainty. It is now pretty generally understood that about one-fourth of all the mortality in England is caused by preventable disease, that the death-rate of large communities may be reduced much below that at which it has been wont to stand, that the average duration of life may be made to approximate nearer to the allotted fourscore, and that the conditions of living may be greatly ameliorated. The chief obstacles to improvement have been ignorance and want of belief. A better knowledge of the laws of life and health, a more rational comprehension of the nature and causes of disease, are gradually but surely entailing improvement in the conditions of living and in the value of life, and the diminution and mitigation, if not extinction, of morbid conditions which have in past times proved so injurious or destructive to life. Such are the subjects contemplated in the work of this section, and as far as time permits the most interesting of them will be discussed. Those selected are of great importance in their relations to public health; let us hope that observers who have formed their opinions from experience in other countries and under different circumstances may throw new light on them.

In the brief space of time at my disposal it would be impossible to give a continuous outline of the progress of preventive medicine during the past, or to trace its growth and development or

<sup>1</sup> Abstract of the inaugural address before the Section of Preventive Medicine of the Congress of Hygiene, in London, England, Aug. 11, 1891, by Joseph Fayrer, K.C.S.I., F.R.S., president of the section (from *Nature* Aug. 20).

of ignorance and superstition to its present well-established foundation on a scientific basis. It is of happy augury for mankind that the subject of public health is now fairly grasped by popular sentiment, and that, though ignorance, opposition, and vested interests still contest the ground, progress is sure, and the light of science is illuminating the dark places. It is now better appreciated than it ever has been, that the causes which induce disease and shorten life are greatly under our own control, and that we have it in our power to restrain and diminish them, and to remove that which has been called "the self-imposed curse of dying before the prime of life."

It is, indeed, only recently that the resources of medical science have been specially devoted to the prevention as distinguished from the cure of disease, and how far successfully I hope in a few words to show, whilst I trust the proceedings of the various sections of this congress will indicate how much remains to be done. Did time permit, I might illustrate the progress of preventive medicine by contrasting the state of England with its population of more than 29,000,000 during the Victorian age with the England of the Elizabethan age with its 4,000,000. I might remind you of the frightful epidemics which had devastated the land, in the forms of black-death, sweating sickness, plague, petechial typhus, eruptive fevers, small-pox, influenza, and other diseases, such as leprosy, scurvy, malarial fever, dysentery, etc., of the wretched mode of living, bad and insufficient food, filthy dwellings, and ill-built towns and villages, with a country uncultivated and covered with marshes and stagnant water (according to Defoe, one-fifteenth part of England consisted of standing lakes, stagnant water, and moist places, the land unreclaimed, and with the chill damp of marsh fever pervading all). The homes of the people were wooden or mud houses, small and dirty, without drainage or ventilation, the floors of earth covered with straw or rushes, which remained saturated with filth and emitting noxious miasmata. The streets were narrow and unpaved, with no drains but stagnant gutters and open cesspools, while the food was principally salted meat with little or no vegetables. To this may be added a large amount of intemperance and debauchery. As it is, I can only just allude to them. In such conditions disease found a continual nidus, and by a process of evolution assumed the various epidemic forms which proved so destructive to life. Some of these have gone, let us hope never to return, and the conditions which fostered if they did not cause them have gone also. Can we venture to hope that it will be the same with those that remain? Our immunity during the last diffusion of cholera gives some ground for thinking it may be so, if, indeed, the legislature and popular intelligence should be of accord on the subject.

If we turn to the present, we find that great improvements have gradually been made in the mode of living; the houses are better constructed, the drainage and ventilation are more complete, the land is better cultivated, and the subsoil better drained; marsh-fever and dysentery, at one period so rife, are unknown, and leprosy has long since disappeared. The death-rate is considerably reduced, and the expectancy of life enhanced. Water is purer, food is more varied and nutritious, clothing is better adapted to the climate, the noxious character of many occupations has been mitigated, and the mental, moral, and physical aspects of the people altogether improved; education is general, a better form of government prevails, and the social conditions are far in advance of what they have been; but still the state of our cities shows that improvement is demanded, and one object of this congress is to point out why and how this may be effected, not only in this country but throughout the world.

If we inquire into the effects of certain well-known diseases, we find that they are less severe in their incidence, if not less frequent in their recurrence. With regard to small-pox, since the passing of the first vaccination act in 1840, the death-rate has diminished from 57.2 to 6.5 per 100,000 for 1880-84, though for the five years 1870-74 it was 42.7, thus showing that there was still much to be learnt about vaccination. Enteric fever was not separated from typhus-fever before 1869, but since then the death-rate has decreased from 0.39 to 0.17 per 1,000, and it has been shown that this improvement was synchronous in different parts of England

with the construction of proper drains. The diminution in the death-rate from typhus-fever is quite as striking, and this also is shown to have run parallel with improved sanitation in more than one large town. The death-rate from scarlatina fluctuated between 97 and 72 per 100,000 between the years 1851 and 1880, and though it has diminished considerably of late years (17 per 100,000 in 1886), a corresponding increase in the death-rate from diphtheria has taken place. This may be due in part to a better differentiation of the two diseases. In 1858 it was reported that phthisis killed annually more than 50,000 people. The death-rate from this disease has not decreased very much for England and Wales, but it has done so in some large towns, notably in Liverpool; and Dr. Buchanan and Dr. Bowditch of Massachusetts both showed a striking parallelism between the diminution of the death-rate from this cause and the drying of the soil resulting from the construction of sewerage works.

Cholera first appeared in England in 1831, and there were epidemics of it in 1848-49, 1853-54, and 1865-66, but the number of deaths diminished each time it appeared, and though it has been present since, it has never reached the height of an epidemic. This is fairly attributable to local sanitary rather than to coercive measures. Preventable disease still kills yearly about 125,000. Towns, villages, and houses are still built in an insanitary way; the death-rate is still higher and the expectance of life lower than it should be, and though we have got rid of the terrible plagues of the middle ages, yet in this century, now closing, other epidemics have made their appearance. Cholera has four times visited us; fevers, eruptive diseases, and diphtheria have prevailed; influenza has appeared several times, even recently, and after leaving us last year, only to return with renewed virulence, caused in the United States a mortality almost equal to that of the plague.

Much has been done, and a great deal of it in what has been called the pre-sanitary age, but much remains to be effected. Let us hope that the future may be more prolific of improvement than the past; international philanthropy seems to say it shall be so. That we can exterminate zymotic disease altogether is not to be expected, but there cannot be a doubt that we may diminish its incidence, and though we may never be able to reach the "*fons et origo mali*," yet we can make the soil upon which its seed is sown so inhospitable as to render it sterile.

The scope and objects of preventive medicine are not limited to the removing of conditions which give rise to zymotic disease, nor even of those which compromise otherwise the physical welfare of mankind, but should extend as well to a consideration of the best means of controlling or obviating those which, attending the strain and struggle for existence, involve over competition in various occupations, whether political, professional, or mercantile, by which wealth or fame is acquired or even a bare livelihood is obtained, and under the pressure of which so many succumb, if not from complete mental alienation, from breakdown and exhaustion of the nervous system, which give rise to many forms of neurotic disease and add largely to the numbers of those laid aside and rendered unfitted to take their due share in the natural and inevitable struggle for existence. Or I might point to the recrudescence of those psychical phenomena manifested by the so-called hypnotism or Braidism, morbid conditions arising out of the influence of one mind upon another. This is a subject which demands not only further investigation, but great precaution as to its application, and claims the watchful notice of preventive medicine on account of the dangerous consequences which may ensue from it.

Again, the abuse of alcohol, opium, chloral, and other stimulants and narcotics, and the evil consequences which may result therefrom, is also a subject worthy of consideration.

The possible deleterious influence of mistaken notions of education, as evinced in the over-pressure which is exercised upon the young, the predominance of examinations, their increasing multiplication and severity, and the encouragement of the idea that they are the best test of knowledge, whilst true mental culture is in danger of being neglected, and physical training, if not ignored, left so much to individual inclination, — this is another subject which demands the jealous scrutiny of preventive medicine, whose

duty it is to safeguard the human race from all avoidable causes of either physical or mental disease.

Though preventive medicine in some form has been practised since the days of Moses, yet it has received but little recognition until a comparatively recent period. When science developed and observation extended, medical men and others became impressed with the influence of certain conditions in producing disease, and thus it was forced upon the public conscience that something must be done; and when philanthropists like John Howard devoted life and property to the amelioration of such awful conditions as existed, — e.g., in our jails, where the prisoners not only died of putrid fever, the result of ochletic causes, but actually infected the judges before whom they came reeking with the contagion of the prisons, — rude sanitary measures gradually came into operation and partially obviated these evil conditions. But it was not before the middle of this century that any scientific progress was made; it was when Chadwick, Parkes, and others initiated the work by which they have earned the lasting gratitude of the human race that preventive medicine became a distinct branch of medical science.

The sanitary condition of towns and communities is not dependent on the views or exertions of individuals alone, for they are and have been for the last fifty years largely cared for by the legislature, and a variety of acts have been passed which deal with questions concerning the public health. Indeed, were all the provisions enforced, little would remain to be desired on the part of the executive government; but as many of them are permissive, not compulsory, the benefit is less complete than it might be. The old difficulty of prejudice combined with ignorance still too often stands in the way, and, despite evidence which on any other subject would be conclusive, the most obvious sanitary requirements are often ignored or neglected. Many thousands of lives have been saved by the sanitary acts now in force; but there is little doubt that more thorough organization under State control, as under a minister of public health, would have most beneficial results, and would save a great many more. We must acknowledge, however, that we are much indebted to the action of the Local Government Board, under whose able administration the most crying evils are gradually being rectified. Through the wise precautions enacted by it against the importation and diffusion of epidemic disease, when other parts of Europe were affected by cholera, this country escaped, or so nearly so as to suggest that it was to sanitary measures we owed our immunity. That there is something in the nature of epidemics which brings them under the dominion of a common law as to their extension seems certain; that there is something about them we do not yet grasp is equally true, but it is as surely the case that local sanitation is the preventive remedy as it is that coercive measures to arrest their progress are unavailing.

Under the improved system of sanitary administration which now obtains, and is gradually developing to a greater state of perfection, the sanitary administration of every district in the country is intrusted to the care of duly qualified health officers — a system from which excellent results have already accrued, and from which better still may be anticipated. The records of the past fifty years prove the influence exerted by sanitary measures on vital statistics. The first reliable tables from which expectancy of life may be derived show that in 1888 to 1894 it was, for males 39.91 years, for females 41.85 years; by the tables of 1871 to 1880 it had increased to 41.35 for males and 44.66 for females. It is shown also that the expectation of life increases every year up to the fourth year, and decreases after that age. For males up to nineteen years it is higher by the last tables, but after that age it is higher by the old table; for females it is greater by the new table up to forty-five, but after that age it is less. The improved sanitation saves more children's lives, but the conditions of gaining a living are harder than they were at the time of the first table, which accounts for the expectancy of life for adult men being less. Women remain more at home, where the better sanitation tells, and are not subject to quite the same conditions as men, so that their expectancy of life is greater than by the old tables up to the age of forty-five. A further proof of the effects of sanitary work is a decreased death-rate. Let us compare the

death-rates of England during the past times with the present; whether they be equally significant for other countries I cannot say, but these, at all events, sufficiently prove the point in question: 1660–79, 80 per 1,000; 1681–90, 42.1; 1746–55, 35.5; 1846–55, 24.9; 1866–70, 22.4; 1870–75, 20.9; 1875–80, 20.0; 1880–85, 19.3; 1885–88, 18.7; 1889, 17.85. In some parts of England, where the main object is the recovery or maintenance of health, the death-rate is down to 9 per 1,000, while in others, where the main object is manufacture and money-making, it is as high as 30 per 1,000.

Nowhere, I think, have the beneficial results of sanitary work been better illustrated than in India during the past thirty years. A royal commission was appointed after the Crimean war to inquire into the sanitary condition of the British army, and this in 1859 was extended to India. The European army was the special subject of it, but the native troops were referred to incidentally. Here the inquiry had to deal with a large body of men, concerning whom, their conditions of existence being well known, reliable information was accessible. It was ascertained that up to that time the annual death-rate over a long period had stood at 69 per 1,000. The inquiry resulted in certain changes and improvements in the housing, clothing, food, and occupation of the soldier. Since those have been carried out there has been a steady decline in the death rate, and the annual reports of the sanitary commissioners to the government of India gave the rates as, in 1886, 15.18 per 1,000; 1887, 14.20; 1888, 14.84. During some years it has been even lower, down to 10 per 1,000, while the general efficiency of the troops has increased. As to native soldiers with whom the European troops may be compared, I find that the death-rate was, in 1886, 13.27 per 1,000; 1887, 11.68; 1888, 12.84. Famine, cholera, and other epidemic visitations, in some years disturb the regularity of the death-rate; under less favorable conditions of living, as in the case of prisoners in the jails, it is somewhat higher. In the Indian jails, for example, it was, in 1886, 31.85 per 1,000; 1887, 34.15; 1888, 35.57.

On the whole, all this indicates improvement, and as regards the civil population progress also is being made; but here, from so many disturbing causes, the figures are neither so easily obtained nor so reliable. The comparatively large mortality is due to neglect of the common sanitary laws, added to extremes of climate which favor the incidence and diffusion of epidemic disease, and intensify it when it has once appeared. A sanitary department has existed in India since 1866, and every effort is made by government, at no small cost, to give effect to sanitary laws. There can be little doubt that the results, so far, are good, that disease generally is diminishing, and that life is of longer duration.

An important result of the observations of the able medical officers of the sanitary service of India has been to show that cholera is to be prevented or diminished by sanitary proceedings alone, and that all coercive measures of quarantine or forcible isolation are futile and hurtful. Here I may say that, large as may appear the death-rate from cholera in India (i.e., in 1888, 1.99 per 1,000 for the European army, and 1.35 for the civil population), it is small compared with that of fevers, which caused in 1889, 4.48 per 1,000 in the European army and 17.09 in the civil population; but there is every reason to believe that these also are becoming less fatal under the influence of sanitary measures.

In preventive as in curative medicine, knowledge of causation is essential. It is obvious that any rational system of proceeding must have this for its basis. A certain empirical knowledge may be useful as a guide, but no real advance can be expected without the exactitude which results from careful scientific observation and induction; the spirit of experimental research, however, is now dominant, and progress is inevitable. How much we owe to it is already well known, whilst under its guidance the reproach of uncertainty which attaches to medicine as a science is disappearing. Recent advances in physiology, chemistry, histology, and pharmacology have done much to throw light on the nature and causes of, and also on the means of preventing or of dealing with, disease. It is impossible to exaggerate the value of the scientific researches which have led to antiseptic methods of preventing the morbid action of micro-organic life, whether the toxic effects produced by them, or those induced autogenetically in the indi-

vidual. Theory has here been closely followed by its practical application in prevention and treatment of disease, whilst the study of bacteriology, which is of such remarkable pre-eminence at the present time, is opening out sources from which may flow results of incalculable importance in their bearing on life and health. That the conclusions arrived at are always to be depended on I doubt, and it seems that scientific zeal may perhaps sometimes outrun discretion. That it might be wiser to postpone generalization has, I think, been more than once apparent, whilst the expediency of further investigation before arriving at conclusions which may subsequently prove to be erroneous should not be lost sight of; but it has probably ever been so in the course of scientific progress, that in the enthusiasm of research, which is rewarded by such brilliant results, early generalization has too often been followed by disappointment, and it may be by temporary discouragement of hopes which seemed so promising.

It would be well to bear in mind a caution recently given by the Duke of Argyll, "that we should be awake to the retarding effect of a superstitious dependence on the authority of great men, and to the constant liability of even the greatest observers to found fallacious generalizations on a few selected facts" (*Nineteenth Century*, April, 1891). Still, it is in the region of scientific research by experiment that we look for real progress, and we can only deplore the mistaken sentiment, the false estimate, and the misconstruction of its aspirations and purposes, which have placed an embargo on experiment on living animals, rendering the pursuit of knowledge in this direction well-nigh impossible, if not criminal; whilst for any other purpose, whether of food, clothing, ornament, or sport, a thousandfold the pain may be inflicted without question. The inconsistency of the sentiment which finds unwarrantable suffering in an operation performed on a rabbit, when the object is to preserve human or animal life or prevent suffering, but which raises no objection to the same animal being slowly tortured to death in a trap, or hunted or worried by a dog, needs no comment; whilst the spirit which withholds from the man of science what it readily concedes to the hunter is, to say the least, as much to be regretted as it is to be deprecated.

It must be remembered that, important as are the researches into microbiology, there are other factors to reckon with before we can hope to gain a knowledge of the ultimate causation of disease. It is not by any one path, however closely or carefully it may be followed, that we shall arrive at a full comprehension of all that is concerned in its etiology and prevention, for there are many conditions, dynamical and material, around and within us which have to be considered in their mutual relations and bearings before we can hope to do so; still, I believe we may feel satisfied that the causes of disease are now being more thoroughly sought out than they ever have been.—all honor to those who are prosecuting the research so vigorously,—and that though individual predilection may seem sometimes to dwell too exclusively on specific objects, yet the tendency is to investigate everything that bears upon the subject, and to emphasize all that is implied in the aphorism, *Salus populi, suprema lex*.

#### NOTES AND NEWS.

At the meeting of the committee on organization of the National Association of Government Geologists, Aug. 29, the secretary, Mr. Arthur Winslow, was instructed to draft a constitution and by-laws to be submitted to the committee at a meeting to be called in connection with the annual meeting of the Geological Society in December next. The secretary was further requested to notify all State geologists of this movement towards organization, and to invite them to be present at the next meeting.

— At the monthly meeting of the Field Naturalists' Club of Victoria, held on July 13 last, as we learn from *Nature*, Messrs. Luehman and French read a note and exhibited the skin of a tree-climbing kangaroo from northern Queensland, new to science, to which they gave the name of *Dendrolagus muelleri*. This remarkable marsupial has a body about two feet in length, with a

tail somewhat exceeding two feet. The disproportion between the fore-legs and the hind-legs is not nearly so great as that of the ordinary kangaroo and wallaby; the toes are strong and curved, to enable it to climb tall and straight trees, on the leaves of which it exists. This tree-kangaroo is more nearly allied to the species which was discovered a few years ago in Queensland than to the two species from New Guinea. The specimen described was got from a straight tree, about ninety feet above the ground.

— M. Imfeld, the Swiss engineer, who has been engaged to examine the nature of the summit of Mont Blanc for the construction there of M. Janssen's proposed observatory, recounts in a Zürich journal the difficulties he is experiencing in his preliminary survey. *Nature* states that M. Imfeld is staying with eight workmen and two doctors at M. Vallot's observatory, which has an altitude of 4,400 metres, and thence they proceed daily to the summit, where they work for several hours a day in the endeavor to ascertain the depth of the snow for the purpose of getting the necessary foundation for the building. M. Eiffel has expressed the opinion that the construction of an observatory will only be possible if the snow does not exceed a depth of twelve metres. M. Imfeld states that they have encountered traces of a ridge of rock eighteen to twenty metres below the summit, and covered with about one metre of snow. They have therefore commenced to make a series of lateral tunnels on three sides, at a distance equal to twelve metres below the summit, to ascertain if the ridge extends to that height. Progress is necessarily slow. Most of the men are suffering from *mal de montagne*. Some, however, who are engaged at M. Valiot's cabin, are able to work almost as long as in the valley, and they also eat and sleep well. In spite of two coke stoves, the thermometer of the cabin never rises above zero; even ink freezes, and water boils at 83°, and they cannot properly cook meat. For a day or two they were disturbed by violent storms.

— In a bulletin recently published by the Pennsylvania Experiment Station (State College, Centre County), Professor William A. Buckhout gives some valuable information relative to the culture of the chestnut. The chestnut cannot be grown successfully on heavy clays, wet soils, or limestone land. It prefers loose, sandy soils, or such as has been derived from the decomposition of slates and shales. In Ohio it is found native on the sand ridges which border on the lake shore, and on the shaly hillsides of some of the hill counties in the southern portion of the State, but never on the limestones which cover the western and south-western portions of the State, nor can it be cultivated in this region with any prospect of success. The chestnut grows readily from the seed, but the greatest care must be exercised not to permit the nuts to become dry. To accomplish this they must be planted as soon as gathered, or else must be kept in moist sand until ready to plant. If possible the nuts should be planted where the tree is to stand, as the chestnut has a long tap-root which renders transplanting difficult. Our native chestnut is practically of but one variety; the European chestnut is not only much larger and finer than the American, but has produced, under cultivation, a number of varieties, some of which are highly esteemed for the superior quality of their fruit. The trees do not grow so large as the American, and come into bearing more quickly; the latter does not usually fruit until ten or twelve years old. Within the past few years species from Japan have been introduced into the United States. Unfortunately they do not appear to be entirely hardy, except in the South and some favored localities in the Middle States. They are quite dwarf in habit, produce nuts larger even than the European, and begin to fruit when they are but four or five years old. These two characters, small size and early fruitfulness, give them special value, and if they can be worked upon stocks of the American species we can secure trees which will bear earlier and produce larger nuts than our native species. The supply of chestnuts never equals the demand in this country, and many districts in which the trees are abundant derive a very respectable income from the sale of the nuts. It is therefore obvious that this is an industry which can be made far more productive and profitable than it now is, since very little effort has been made towards cultivation.



## SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES

PUBLISHED BY

N. D. C. HODGES,

47 LAFAYETTE PLACE, NEW YORK.

SUBSCRIPTIONS.—United States and Canada.....\$3.50 a year.

Great Britain and Europe..... 4.50 a year.

Communications will be welcomed from any quarter. Abstracts of scientific papers are solicited, and one hundred copies of the issue containing such will be mailed the author on request in advance. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

THE FARMER AND TAXATION.<sup>1</sup>

[Continued from p. 132.]

It has been proposed, indeed has been done in many States, to make every man swear to the truthfulness of the returns, and to provide adequate penalties for false returns. Experience shows, alas, that men will swear falsely by the whole-sale and really seem to think little of it. Nor would any American community favor the establishment and enforcement of penalties which would really accomplish anything in this direction. As long, therefore, as this system remains we may expect to see the farmer unjustly burdened, simply because, as conditions are, a larger portion of his wealth is in such a form that it cannot escape taxation.

The country districts are, however, at a disadvantage in another direction. Owing to their declining wealth and population they must either continually advance the tax rate or they must be content to see the public institutions of the community go slowly backward. The number of people in the country as compared with the city is, as we have seen, steadily decreasing, i.e., the cities are growing steadily larger, and embracing a continually increasing proportion of the population. This means, of course, either that the burdens for the support of schools and other public institutions will grow heavier and heavier, or that they shall not advance, or, indeed, shall retrograde. It is no uncommon sight to see the schools gradually deteriorating in the rural districts. It is not merely true in Pennsylvania, Ohio, and Illinois, but even in the New England States,—that classic land of education, where all classes take a pride in the liberal support of all public institutions, such as the school, the church, the public library, etc.

This is a disadvantage not merely for the country but for the city as well. Once let the rural school and other similar institutions become thoroughly low in character, and more and more people will wish to leave the country, and the stream into the cities will be swollen still more. American people will not be content to live permanently in a region where all the institutions which make life worth living are gradually going backwards.

<sup>1</sup> Address before the Section of Economic Science and Statistics of the American Association for the Advancement of Science, at Washington, D.C., Aug. 19-25, 1891, by Edmund J. James, vice-president of the section.

It is for the interest of the whole nation, then, and not merely for that of the farmers, that the attractions of country life shall be increased and not diminished. The existence of good schools, churches, good roads, lyceums, libraries, and other means of education, throughout the country districts is necessary to the welfare of the whole community. Our great cities live upon the country in more senses than one. They are dependent upon it not merely for the material means of living, such as grain and meat, but for population itself. Statistics show that the death-rate in cities is rather higher than the birth-rate, i.e., if the cities could not draw upon the country they would soon begin to decline in size. Such being the case, it is of the highest importance to the cities, and to the country as a whole, that those classes which feed the cities, and give them the very bone and sinew of their existence, shall have the very best opportunities for an education. In the interest of the rural districts themselves the same thing is demanded. The draining away to the cities of the best blood of the young generation inflicts a continual loss upon the country. And yet if the attractions of country life on its intellectual side cannot be increased we may expect to find this loss a continually increasing one. At the very time, then, that farmers ought to be making increased expenditures for public purposes, we find their means of making such expenses curtailed.

The farmer, then, suffers under the changes incident to the continual advance of the country. He suffers from the growing depopulation of the country, and he suffers from the incidence of a system of taxation which did well enough a century ago but is now as antiquated as the plough or wagon of that time. What shall be done to help him?

In the first place, trying to doctor the present system here and there, as I said before, will not help him. We cannot materially improve our present system of taxation by little changes introduced here and there. I take absolutely no stock in the desirability of attempting it, or in the hope of achieving success if it were attempted. A general property tax, such as we have now in most of our American States, I regard as a hopelessly inefficient one, and highly unjust in all its effects. Even if it were possible to do anything with it, I should be opposed to retaining it, as it is, in my opinion, fundamentally vicious in such a condition of society as ours. It is, moreover, impossible to do anything with it, because it cannot be enforced. It is useless to try to ascertain all the property which a man possesses in our society. It was not possible for the tax gatherers in the Middle Ages to do it, when they could apply the thumb-screws *ad libitum* as an assistance to the memory of forgetful tax-payers,—how much less to-day, when no jury in the United States would convict an ordinary citizen of perjury because of false returns to the tax assessor. When it is possible for a man like one of the Vanderbilts to swear that he has only \$100,000 in the world which is liable to the general property tax, and it is impossible to prove the contrary in the case of such a well-known person, what is the use of trying to reach the property of the ordinary citizen by such means? I think I am fully within the truth when I say that no one who has made any study whatever of tax questions thinks that a general property tax upon personal property can be collected. The scientific students of taxation all agree, I think, to a man, that a general property tax of this sort is a relic of mediævalism, and should be abolished as soon as possible.

The farmers of all classes ought to be opposed to such a tax. Why? Because, besides the reasons already given, the effect is more injurious to the country than to the city.

It is easier to collect such a tax in the country, because people in the country know more, as a rule, about the affairs of their neighbors than those of the city. It would be impossible for a farmer to have any great amount of money invested in mortgages, etc., without it coming more or less to the knowledge of his neighbors, and hence to the ears of the assessor. In the city, on the contrary, the individual is lost in the crowd. The result is that as soon as the farmer has any considerable funds in this form there is great temptation to move to the city, and hence another inducement is added to the already too long list which tend to drain the country of its very best elements.

The taxing of mortgages and money at interest is another subject which has attracted a great deal of attention. Who pays this tax? Some authorities say the borrower, some say the lender. Of course, if a tax be levied upon money now invested in mortgages, and collected from the owner of the mortgage, the money-lender must pay it. But how about the new mortgages? If it were possible to reach absolutely all the money up for loan we might make such a combination possible by which the lender would have to pay it. But as things are now, the bulk of the money escaping it altogether, even in those States where such a tax is nominally levied, with many States which do not seriously try to levy such taxes, he must have large faith who believes that the money-lender must pay this tax instead of the farmer, when he charges so much the more interest by reason of the tax. At any rate, it is not an important element in this problem, in my opinion. We must begin at the other end and try to reach quite a different class in the community. We can dispense with the tax on mortgages very easily if we reorganize our revenue system as we ought.

The farmer can be helped, then, as I insisted at the beginning of my paper, only by a radical change in our revenue system — a change which will remove taxation from the place where wealth is not, and put it where it is. To do this we must use the State and National Governments. Speaking generally, his taxation must be lightened, and the income of local communities, particularly the rural districts, must be increased for public purposes. The lines along which this revolution must be made I shall briefly indicate. In the first place, farming property should be exempted from all taxation for State purposes. This has been done already in some of the States, in Delaware among the rest. In Pennsylvania, for example, the tax on real estate is solely for local purposes. The State does not levy any assessments upon real estate for State purposes. This may not seem a very considerable lightening of the burdens, but it is important, since when a man is loaded beyond his strength every decrease of the burden is of significance. In the second place, the State must come to the support of the local community, and that in two ways. It must distribute large sums to the communities for the support of local institutions, like the schools; and it must assume the entire expense of certain public functions, like that of justice, and especially the support of the unfortunate poor, such as the insane, the blind, idiotic, etc., as also the expense for penitentiaries.

The support of the unfortunate poor is something which no local community can reasonably undertake, for it has not the facilities to extend such care to them as our modern humanity demands. All such people ought to be put in asylums and supported at general and not local expense. Nor can the local units afford to provide as they ought for the criminal classes. They are, moreover, oftentimes not at all responsible for the criminal character of the population, as

the latter may have drifted in from other communities, or, indeed, from other States.

The care of the unfortunate and criminal classes requires the employment of highly educated and specially trained people, whose services can not be commanded by localities, even if they could pay the expenses for suitable buildings, which, as a rule, they cannot. The expense of the courts might also be borne by the State to a very large extent. The existence of county courts, for example, does not accrue alone to the benefit of the people of the county, but quite as much to the people of other localities, or indeed of other States, who may have occasion for any reason to claim their services in any action at law.

The support of schools is also a function in which not merely the local community is interested, but all parts of the State as well. I think that every one must say that our farming communities are not at present able to pay the expenses of really good elementary schools. It is, in a large proportion of the rural districts, impossible to find anything more than elementary schools. Yet there is no reason why the advantage of good high schools should not be open to farmers' children as well as to the children of city people. If there were good schools in the country, we should find that many people would stay there who now go to town as soon as they can rake and scrape the money together. The only way in which such school facilities can be offered is for the State to come to their aid in an efficient manner. In many of the States already a school fund is provided, the proceeds of which are distributed among the school districts. In some States this pays the salary of the teacher for six months or more in the year. In other places the State government raises by taxation a large sum, which is distributed in the same way among the school districts. In a few States the State government pays a large share of the expense wherever communities will establish high schools. Adequate educational facilities can never be obtained in this country until the State governments undertake to look after the matter themselves, and contribute handsomely to the support of good schools of all grades. It is simply impossible for the farming districts, under existing conditions, to raise adequate sums for this and all other purposes which they must look after.

Another department in which the localities must be aided is that of maintaining good roads. Since the advent of the railroads we have done next to nothing toward improving our local means of communication. Such abominable, horse-destroying highways as exist in most of our American States you can not find in any other civilized country. The farmers waste as much money, time, and horse flesh in getting their crops to market over a few miles of our ordinary American roads as would suffice to take the crops around the world on a railroad or steamer. Local management and support of the roads, as we try to work it in this country, has always given poor roads in every country where it has been tried. All other civilized countries have gone over to a reasonable system, under which the leading roads of the State are under the supervision of State engineers and at State expense; the roads which are merely county are kept up by the county, while only the very subordinate roads, the paths across the fields, etc., are saddled upon the road district. The roads are, however, to-day of immensely greater importance to the farmer than they were a century ago. In 1800 nearly all the products of the farm were consumed on the farm. To-day the bulk is shipped to market. The cost of transportation is largely a burden on the farmer. Any

diminution in the cost helps him, and it also helps the inhabitant of the city; and while the latter profits by good country roads he contributes nothing to their support, but leaves the entire burden of constructing and maintaining them on the farmers.

Local management of these institutions, then, and the attempt to make the localities pay for them, lead to two things, relative overburdening of the farmers, and inefficient institutions. The general neglect of our country roads leads to the massing of the population along the railroads, placing them still more completely at the mercy of the railroad managers than they are now.

The thoroughgoing reform of our financial system means, however, more than the mere utilization of the State government in lifting the weight of local burdens. It means a further utilization of the Federal Government for the same purpose. Under the political system which we adopted a century ago we distributed the functions of that time among the national, State, and local governments in a way which experience has shown to have worked very well down to a recent date. If the economic conditions of a century ago had remained the same until to-day, the system would be still as good as then. But the railroad came in to modify and change everything. Aided by the federal, State, and local governments to the extent, in many cases, of building their lines for them, they have continued to increase in number and importance until they dominate our whole industry and government. Nothing can be done without their consent. No problem can be solved without considering the railroads. They have changed the centres of trade and industry. They have shifted the centre of agriculture. They determine more and more the lines along which industry and population must move. They have been built and are now building, not necessarily in places where the true interests of the country would have dictated, but oftentimes where ideas of private interest, caprice, and fancy may have ordered. They have built up great sections of the country, it is true, but they have also ruined others. They have developed farmers on the icy plains of Dakota and on the burning sands of New Mexico, but have driven a race of farmers to the wall in New England, Pennsylvania, Delaware, etc. I do not mean to say this is not good. It may lie in the interests of the country to change the centers of industry. But when this is done by a national policy it is not fair to ask one class to bear all the burden.

Now we have given to the nation the most fruitful sources of revenue and to the community the heaviest burdens to bear. The defence of the country against foreign aggression has never been a very heavy burden, and it is destined to become lighter and lighter; but the burden of keeping up the educational institutions of the country, the load of keeping up the means of local communication by the system of country roads, the support of the courts open to all citizens of the United States, the support of the poor, the blind, idiotic, insane, etc., are heavy, and continually growing heavier. To the federal government we have given the right to resort to all sorts of taxation,—duties on imports, on domestic products, on incomes, on lands, on polls, in fact every kind of privilege in this respect consistent with the practices of a free government, except taxes on exports. To the States we have, it is true, also given the right to levy all sorts of taxes except duties on imports and exports; but the industrial circumstances prevent us from resorting to the most fruitful sources, to those places where the real wealth of the community to-day lies. No State dares tax its domestic manufac-

tures, for example, from fear that the manufacturers will move into another State. We cannot levy an income tax, for fear that the citizens will reside somewhere else. This practically keeps us from resorting to the most fruitful sources of revenue altogether. One may say, How is this different from the condition of things a century ago? If our fathers got along well then, why should not we now?

A century ago a State could resort to such taxes as it chose, because the impediments to changing one's residence or moving one's business were practically so great that nothing short of the very heaviest taxation could move one to try to avoid it by altering his location. To-day, on the contrary, thanks to the railway, there is almost no obstacle to living in one State and doing business in another. The merchant in New York city can live in Connecticut, New Jersey, or New York, or even Pennsylvania or Massachusetts, and still be in New York every day for business. The citizen of Wilmington can reside in Delaware, Maryland, Pennsylvania, or New Jersey. Of course under such conditions the various States have to be very careful about levying taxes, and the possibility of adopting taxes which a century ago were easy to use and collect is very much limited.

In a word, our financial system and our industrial system are no longer in harmony, and they are daily growing wider and wider apart. The bodies which have heavy public burdens have only limited financial resources, and those which have large resources have comparatively few functions. The places where the wealth is not are taxed, and those where it is are left untaxed. Now there are only three ways out of the difficulty. Either the functions of the federal government must be increased to correspond with the greater financial power of that body, or greater financial power must be conferred upon the local bodies by allowing them to tax imports from other States in order to enable them to adopt an excise system, or we must collect through the federal government those revenues for local purposes which can be reached only through its agency. The first of these is undesirable, the second impossible, while the third is at once practicable and possible.

If we would have a reasonable system of taxation we must entrust to each public body the collection of such taxes as it can most easily raise. Thus the tax on land can easily be raised by the local bodies, such as city, school district, township, and county. The taxes on corporations which do business over a whole State, like the railroad corporations, cannot be collected by the local communities. Nothing is more ridiculous than for a township, for example, to try to collect a tax on a railroad which runs through it. If it assesses merely the value of the road-bed for what may be termed ordinary uses, the assessment is, of course, ridiculously low. If the local assessors attempt to assess such a part of the whole value of the road as the local part bears to the whole length of the line, they have no means of compelling payment or of proving that their assessment is a fair or just one. The only sensible thing is to allow the State government to tax the railroads and divide the results of the tax among the communities in the State. The same thing is true of other sorts of taxes as well.

In the same way the collection of import duties is one of the most fruitful sources of taxation, and that whether you take a so-called tariff for revenue only, or a so-called protective tariff. No State or local community can collect these taxes, and yet to let these taxes go uncollected would be a very short-sighted financial policy, since you can raise large sums by this device without injuring the country at all.



Take, again, the whole line of manufacturing trusts and similar organizations in this country, the Standard Oil monopoly, for example. Here is an excellent subject for national taxation. No State can reach it. It has practically withdrawn itself from State control, and as we make no attempt to control it by national means, it is practically untaxed. Now this is very foolish and unreasonable. What shall be done about it? No city or county or State can tax it. Shall we let it continue to go untaxed? By no means. We should tax it through the agency of the national government, and take the proceeds for local purposes.

We must no longer look upon the county government as opposed to the township in matters of taxation, or the State to the county, or the federal government to the State, but upon all as a part of one and the same system of government, to be used by the people in the manner and to the extent to which its interest may dictate.

In a word, then, the solution of the financial difficulty in this country, as I look at it, is simply this: Let us use each part of the government, city, town, school district, county, State, and nation, to administer those taxes which it can most easily manage, and then divide the proceeds upon such basis as experience may dictate to be the best. Briefly indicated, and only in the most general way, the land tax ought to be left to the ultimate unit—city, town, road, school, poor district, etc. The State ought to levy an elaborate system of corporation taxes upon such corporations as it can efficiently reach; and, finally, the nation ought to levy the indirect taxes, such as excise and customs duties, and such other taxes as circumstances may show to be desirable, such as taxes upon the great combinations of capital which extend their operations over the whole country, and possibly also upon incomes. We should take the proceeds of such taxes beyond what may be necessary for an economical administration of federal affairs, and utilize them for local purposes. The States should use the funds derived from the taxes administered by itself, partly for the performance of a larger range of functions, partly in assisting in the performance of local functions, as in making roads, etc., and partly in distribution among local units for local purposes, as schools, etc.

I am all the surer that this is the proper solution, as it is the one which modern nations situated somewhat like our own have found it necessary to adopt. As said above, the problems of modern taxation have come up in all nations in a very similar form. Local taxation has assumed an importance hitherto unknown, and the relation of the farming class to other classes in this matter has been a troublesome one. England, France, and Germany, which in their economic conditions most resemble our own country, have all found it necessary to resort to some such plan as that here outlined.

No amount of patching is going to help us in this matter. No attempt to strengthen the hands of local tax assessors or tax collectors is going to afford any permanent relief. The more tax commissions we have which give such advice as the late ones have given us, the more money will be wasted, and the time will be the more delayed when a reasonable system will take the place of the present antiquated patch-work.

Before closing, I should like to revert again to a point already mentioned, touch upon another phase of the question which I regard as even more fundamental than that of taxation, important as is the latter, and that is, the whole economical condition of the farmer as compared with the other

classes in the community. I touched, at the beginning of my address, upon the revolution which the modern system of transportation had effected in the condition of the farmer; how it has brought into competition with him not only the farmer of the Mississippi Valley, but has planted a competitor on the slopes of the Pacific, nay, even opened up Africa and Australia as competing territories. The farmer was formerly assured of a certain even though it were a small market. His market is now large but very uncertain.

The farmer feels the burden of taxation, in a word, largely because his economic situation has become an unfavorable one. The prices of agricultural products of the staple variety have gone down in the great European market upon which we rely to dispose of our surplus products. It looks very much as if they would never rise again, at least not for a long time to come. The settlement of Australia, of South America, and of Africa will more than keep pace with the wants of the world for breadstuffs; and until Russia, Asia, India, Africa, Australia, and South America are so fully settled that they will consume their own food-crops we need not expect to see a rise in the price of staples. No amount of bait thrown out to European nations in the form of low tariffs is going to persuade them to take our corn and wheat at high prices when they can get Russian and Indian products at low prices.

Now if this be a true diagnosis of present conditions, what can the farmer do to be saved from being ground to powder between the upper and nether millstones; between a system of taxation, on the one hand, which leaves the great accumulations of wealth relatively untouched, and rests chiefly on agriculture, and a world-economic movement, on the other, which is knocking the bottom out of all staple products? My answer to this question, as far as the first point is concerned, is to reform your system of taxation; as to the second, make yourselves independent of the staples. Let us try to discover and utilize new products. We can no longer rely upon the old crops to keep us alive. We must discover new branches of agriculture. Perhaps it will be found, as in Germany, in the discovery of a sugar plant, or in the cultivation of tea or coffee, or a new textile plant, or something else. Now from what source have we to look for the introduction of such a plant or plants? Who can bear the initial expense of ascertaining by a long series of costly experiments what kind of soil and climate are best fitted to each new crop. Manifestly only the government. Hence the absolute necessity of the government experiment station, planted in every State, and endowed on such a scale as will enable it to make the most costly and long-continued experiments upon every new crop which seems to promise any hope of naturalization. We have been naturalizing men long enough. Let us now try systematic plans to naturalize every useful plant which is to be found in any other country. The federal government has begun this work on a fairly liberal scale. It should be your business as farmers to see that these appropriations shall be made on a still larger scale than ever, and that in each district in the State a careful examination of soil and climate by scientific experts shall be made, with a view of determining what new crops can be introduced into such places. In this way you will find that the introduction of a new crop will go a long way toward solving the taxation and all other problems, since it will introduce prosperity where adversity now prevails—an expanding agriculture instead of a declining one, etc.

Perhaps a word might not be out of place at this point as

to the work of the experiment stations themselves. I cannot help feeling that much of their effort has not been so economically applied as it might be. It is, of course, an interesting fact to know what the growing power of a pumpkin is, for example. How many tons a water-melon vine can lift in the course of a year, and similar items of information, may, in the course of time, when all added together, produce valuable practical results; but I cannot but believe that a much larger share of the time and effort should be devoted to ascertaining the possible uses of the thousand-and-one forms of vegetable life around us. Man progresses but slowly. Of the thousands of plants which cover the face of the earth we have found use for comparatively few. They are mostly still ranked in the category of weeds, i.e., useless or injurious plants. It has not been so very long since the potato was in this category. Now it is my opinion that every plant has some valuable use or other if we only knew it. It is pre-eminently the work of such scientific stations to enlarge the number of useful plants by such experimentation as shall test their applicability to one or another of the practical arts. He who makes two blades of grass to grow where only one grew before is a benefactor of the race. How much more a benefactor he who gives two useful plants instead of one. Who can calculate the advantage to humanity of the development of the potato or of the sugar beet?

The scientific experimental station, then, should give us new plants, naturalize those already known, and determine the best conditions for the cultivation of all kinds which may be made to grow in any given locality. The same thing should be done, of course, for animals as for vegetables. There is little doubt that in each State, for example, many plants and animals could be profitably cultivated which are practically unknown at present. The experimental stations should work at these problems until they are successfully solved. I say at each station, for the station of Pennsylvania, or that of Illinois, or Ohio, will benefit Alabama only indirectly, since crops which will grow very well in the former States will not grow well in the latter, and many which might prove profitable in the latter would not grow in those States at all. Each locality must solve its own problems in this respect for itself. It has been found, for example, even in such a small country as Germany, that a beet which will produce a large quantity of sugar in one part of the country, when taken to another loses its sugar very quickly. How much more would that be the case in such a country as our own.

Let us keep up our experiment stations then. Watch them closely, to see that they are at work at useful things, but support them liberally. See to it that the federal government, which has now begun the support of these institutions, shall deal liberally with them. Give them all the money they can wisely use. We shall find that that will be a great deal, and you will find that it will very well pay for itself.

#### HEALTH MATTERS.

##### The Tetaniferous Man.

VERNEUIL applies this term to the individual who carries the virus of tetanus around on his person, although unaffected by the disease himself. The author discusses the causes and means of prevention of this affection from a clinical standpoint. If one considers the horse, with its secretions, excretions, and surroundings, as all-capable of propagating tetanus, we cannot regard as impossible infection by the secretions and excretions of man. The

tetanic property of equine saliva has been demonstrated. The saliva of a human being may, for the time being, contain tetanus germs, and thus a bite from such an individual may cause tetanus. A case is given illustrating this. The secretions and excretions are only infected by the ingesta, so that the sperm, milk, and urine are never infected by the virus. He says, according to the *University Medical Magazine*: "I have already admitted, and now I admit more than ever, that a surgeon who has dressed a tetanoid patient may communicate the disease to other patients. I also admit that any person whatever, but above all a physician whose hands have been in contact with a horse, not tetanic, but simply tetaniferous, may infect the wounds of his fellow-beings, as in the cases cited. I also admit, finally, that such a man is not only dangerous to those whom he approaches, but may even give himself tetanus by auto-inoculation, either by wounding a part of the skin impregnated with the virus, as the plantar and palmar regions, or touching a wound on any part of his body with his impure hands." Two cases follow, in which he traces the cause to a wound inflicted on the skin, which was previously infected with the tetanic virus. The bacillus of Nicolaier was found in one of these cases. Three additional cases are given with a very careful analytical study of each.

##### London's Soot.

The amount of carbonaceous and other particles deposited upon glass houses is a good indication of what the London atmosphere contains, and in many places it is only possible to procure a due admission of light to the plants by frequently washing the glass roofs. At one establishment, says the *Pharmaceutical Record*, two tanks constructed to collect the rain from a house completed a few years since, were cleared out, and no less than ten barrow-loads of sooty matter were removed, all of which must have been conveyed into the tanks from the glass. One scientific man has been engaged in computing the amount of soot deposited from London air, and arrived at the following conclusions. He collected the smoke deposited on a patch of snow in Canonbury one square link (about 8 inches) in extent, and obtained from it two grains of soot. As London covers 110 square miles, this would give us for the whole area 1,000 tons. As the quantity measured fell in 10 days, a month's allowance would need 1,000 horses to cart it off, and these stretched in a line would extend four miles.

##### Origin and Role of Pus Cells.

Professor Ranvier made an interesting communication at a recent meeting of the Academy of Sciences on the origin and significance of pus cells. He said (*Brit. Med. Jour.*) that for some years past histologists generally were agreed that the cells of pus were none other than the white corpuscles of the blood, which had emigrated from the vessels at the time suppuration was set up. He found it difficult, however, to believe that the blood could yield in this way, and in a time comparatively short, the enormous quantity of pus found in many pathological conditions, such, for example, as the purulent infection of wounds, accidental and operative. That the white cells do emigrate in the manner generally accepted he had no doubt. This takes place under normal physiological conditions, while it is still more pronounced in certain pathological states not ending in actual inflammation, in the process of which it is, of course, abundantly evident. What his experiments led him to establish, however, was that pus cells had also quite another origin, viz., the transformation into lymph cells of clasmotocytes, elements derived from migratory cells, which under the influence of irritation revert to an embryonic condition and proliferate rapidly. As to the rôle of the pus cells, M. Metchnikoff has shown the importance of lymphatic cells in the combat of the organism against microbes. In simple inflammation determined by caustics, or other irritant agents, their rôle is not less important. They eliminate the dead elements, and thus prepare the way for the processes of regeneration.

##### The Value of the Tongue as a Respirator.

J. M. Elborough writes as follows to the *Lancet*: It is not generally known that nature has provided each of us with the best respirator always at hand in the tongue. For years I have per-

sonally relied on this alone, and have recommended this proceeding to many patients. When facing a cold east wind, or breathing quickly the night air, I never quite close my mouth, but purposely keep the lips a trifle parted, and at the same time curl up my tongue towards the roof of my mouth until the tip reaches as far back as the soft palate, and I gently press the arched under surface of the tongue in some degree against the hard palate (a little practice soon makes this easy to do). The cold air then, as it enters the mouth, strikes against the under surface of the tongue, as well as the floor and sides of the mouth, and is made to pass in a somewhat circuitous manner between the sides of the tongue and the buccal mucus membrane of the pharynx, being thereby warmed in its course, so that by the time it reaches the larynx it is nicely rid of chill, and does not excite cough and catarrh. At the same time a certain quantity of air, of course, finds its way through the nasal passages to the chest, and it is obvious that a larger quantity of cold air can be effectually warmed by this method of procedure than by relying on either the nose or mouth alone. That the large blood-supply of the tongue renders this organ an excellent air warmer must be obvious to all.

#### The Sense of Taste in the Larynx.

For many years it has been known to histologists that the specific end-organs of taste, namely, the taste-bulbs, occur on the posterior or inner surface of the epiglottis, but up till now the physiological proof of the existence of the sense of taste in the epiglottis has not been forthcoming. Michelson, according to the *British Medical Journal*, Aug. 8, under Langendorff's direction, made a number of experiments, which show that the inner surface of the epiglottis is endowed with taste. A Schroetter's laryngeal sound, tipped with a solution of quinine or saccharine, was introduced into the larynx, and the drop of the sapid substance was cautiously brought into contact with the inner surface of the epiglottis. Positive results were obtained, which were controlled by the sensation — electrical taste — known to be produced by electrical stimulation. It seems, therefore, proved that a part of the nerve fibres passing to the larynx are nerves of taste.

#### LETTERS TO THE EDITOR.

*\*\* \* Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

*On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.*

*The editor will be glad to publish any queries consonant with the character of the journal.*

#### An Upright-Walking Lizard.

I REMEMBER reading, some time ago, a report of the discovery of the fossil remains of a large lizard-like creature which must have walked upright on its hinder limbs. The saurians which made the footprints found in some sandstone formations probably walked in the same manner. But it may not be generally known that at least one existing species of lizard habitually runs erect on its hind-legs. This little fellow I noticed, in May, 1891, on the Mojave Desert of California, between Mojave and Death Valley. He is about one foot in length, of color varying from pale yellow to orange. His forward limbs are short and slender. While feeding, he holds his food in his fore-paws, much as a squirrel holds a nut. While seeking food, or resting, he remains on "all fours," but on starting off, especially if frightened, he rises on his hinder legs and runs away very swiftly, the action of the legs having a ridiculous resemblance to those of a small boy "in a hurry." I have seen one of these lizards run in this manner for thirty or forty yards.

C. W. KEMPTON.

New York, Sept. 8.

#### The Application of Concussion to Suspended Mist.

PROFESSOR H. A. HAZEN's recent criticism of the rain-making experiments seems well-timed. As Espy made important additions to the theory of latent heat as applied to the uprising moist air in cyclones, would it not be well to try the experiment of successive concussions upon suspended mists. If very small drops of rain collect upon a window pane any sudden jar will cause the small drops to coalesce into large drops. Then why is it not pos-

sible to produce a like effect upon small floating rain particles? The concussion from a lightning flash usually results in an immediate downpour. By all means let those who have experimented come forward with the results.

WILLIAM A. EDDY.

Bergen Point, N.J., Sept. 5.

#### AMONG THE PUBLISHERS.

THE S. Carson Company, San Francisco, have just published "Forensic Eloquence," by John Goss, a treatise on the theory and practice of oratory as exemplified in great speeches of famous orators.

— D. C. Heath & Co., Boston, have issued "A Brief Spanish Grammar," by Professor Edgren of the University of Nebraska.

— Professor W. S. Chaplin, professor of engineering at Harvard University since 1880, has been elected chancellor of Washington University of St. Louis.

— The Tragedy of the Cæsars" is the title of a new work by the Rev. S. Baring Gould that Methuen & Co. have in the press and hope to issue shortly. It will be illustrated from busts, gems, cameos, etc.

— Houghton, Mifflin, & Co. will publish on the 12th the first two volumes of the new large-paper edition of the works of Oliver Wendell Holmes; and a new cheaper edition of S. P. Langley's "The New Astronomy."

— Major Wissmann's new book of African travel from the Kongo to the Zambesi, in the years 1886 and 1887, which he calls "My Second Journey Through Equatorial Africa," will be published in England by Chatto & Windus. The volume will contain a map and nearly a hundred illustrations.

— Messrs. Macmillan & Co. intend to publish soon a series of popular sketches on the history of astronomy from the earliest times to the present day, in the form of a volume containing three courses of lectures on astronomical biography by Professor Oliver Lodge, F.R.S. The work will be fully illustrated, and will bear the title "Pioneers of Science."

— The assiduous biographer of Dr. Johnson, James Boswell, would certainly approve of the devotion of his own biographer, Mr. Percy Fitzgerald, who has written a "Life of James Boswell," which is to be published shortly by D. Appleton & Co. Mr. Fitzgerald has made a book full of anecdotes. It will contain portraits of Boswell and of Dr. Johnson.

— Charles Scribner's Sons have in preparation a series of concise biographies of the men whose systems have marked successive stages in the progress of education, from Aristotle to Dr. Arnold. It will be edited by Professor Nicholas Murray Butler of Columbia College. Mr. Thomas Davidson will undertake Aristotle; J. G. Fitch, Pestalozzi; J. Courthope Bowen, Froebel; Professor Butler, Horace Mann.

— The recently completed fifth edition of Dr. M. Foster's well known "Text-Book of Physiology" will be followed at once by the appearance of a sixth and cheaper edition of the work in parts, carefully revised throughout by the author. The addition of much new matter to this edition of the book will permit of taking out a copyright on the American edition, which is to be published by Macmillan & Co.

— Roberts Brothers will publish soon a new volume in Miss Wormeley's series of translations from Balzac's works, entitled "An Historical Mystery," being one of the "Scenes from Political Life;" a complete edition of Burnand's "Happy Thoughts," and the first American edition of the same author's "More Happy Thoughts;" the third volume of Renan's "History of the People of Israel," treating the subject from the time of Hezekiah till the return from Babylon; and "Four and Five," by Edward Everett Hale, which is a continuation of the "Ten Times One" series.

— The aim of "The Transition-Curve Field-Book," by Conway R. Howard, C.E. (New York, Wiley), is to furnish plain, practical rules and examples for guidance in adjusting and locating a curve, nearly identical with the cubic parabola, as a transition-curve in connecting circular railway curves with tangents. The work is

simplified in application by the aid of a general table, and illustrated by rules and examples for various problems of location. The book also contains tables of radii, sines, tangents, versines, and external secants (109 p. 16").

—Silver, Burdett, & Co. have now ready "The Teacher's Handbook of Slöjd as Practised and Taught at Nääs," by Otto Salomon, assisted by Carl Nordendahl and Alfred Johansson, and translated and adapted for English teachers by Mary R. Walker and William Nelson. The volume belongs to the new department of wood-handicraft or educational carpentry, already finding a place in our advancing school system, and is an able exposition of the work done by the famous school at Nääs, Sweden. It contains explanations and details of each exercise and is generously illustrated.

—"Hereditv, Health, and Personal Beauty" is the title of a book published recently by F. A. Davis, Philadelphia. The author is John V. Shoemaker, M.D., who is a professor at the Medico-Chirurgical College of Philadelphia. There seems to be some confusion in the matter brought between the covers of this book; for, while the main portions are devoted to the laws of health as understood by the author, there is introduced considerable matter that has a bearing primarily on the doctrine of evolution, and not directly, at least, on the preservation of health. The author is an advocate of all things moderate in this life. The mode of treat-

ment of the subject is such that the non-professional reader can readily follow. Not only are there given suggestions as to the mode of life most likely to lead to general good health, and consequent good looks, but the methods considered best for the care of the skin, nails, and hair are discussed in several long chapters.

—The Johns Hopkins Press are preparing a volume on the "Spanish Institutions in the South-west," by Frank W. Blackmar, professor of history and sociology in the Kansas State University, which will be ready shortly. The work is a study of the social and political institutions of Spain as represented by the life of the Spanish colonists in America, consequently it treats of the founding of the Spanish missions in California, Arizona, New Mexico, and Texas, and portrays the civilization established by the padres, the social condition of the Indians, and the political and social life of the pioneers of the South-west.

—Hon. Carroll D. Wright will begin in the October *Popular Science Monthly* a series of papers under the title "Lessons from the Census." In the first of these he sketches the changes in scope and methods which the United States census has undergone in the past hundred years, and shows that its immense growth has made it a somewhat clumsy machine. The series of articles on American industries will be continued in the same number with a fully illustrated account of "The Manufacture of Steel," by William F. Durfee, giving the history of the industry from colonial times to

## PRACTICAL WORK IN ORGANIC CHEMISTRY.

By FREDERICK WM. STREETFIELD, with a Prefatory Notice by Prof. R. Meldola. 156 pages, with 35 illustrations, \$1.25.

E. & F. H. SPON, 12 Cortlandt St., N. Y.

## OF WHAT USE IS THAT PLANT?

You can find the answer in

## SMITH'S "DICTIONARY OF ECONOMIC PLANTS."

Sent postpaid on receipt of \$2.80. Publisher's price, \$3.50.

## SCIENCE BOOK AGENCY,

47 Lafayette Place, New York

### THIRD EDITION.

## THE FAULTS OF SPEECH

BY

A. MELVILLE BELL,

Author of "Visible Speech," etc., etc.

The Faults of Speech is a Self-Corrector and Teacher's Manual, for the removal of all Impediments and Defects of Articulation.

60 Cents.

\*\* Sent postpaid on receipt of price,

N. D. C. HODGES, 47 Lafayette Place, N. Y.

**BOOKS: How to Exchange them for others.** Send a postal to the SCIENCE exchange column (insertion free), stating briefly what you want to exchange. SCIENCE, 47 Lafayette Place, New York.

"The Week, one of the ablest papers on the continent."—*Descriptive America.*

## THE WEEK,

A Canadian Journal of Politics, Literature, Science and Art.

PUBLISHED EVERY FRIDAY.

\$3.00 per Year.

\$1.00 for Four Months.

THE WEEK has entered on its EIGHTH year of publication, greatly improved in every respect, rendering it more worthy the cordial support of every one interested in the maintenance of a first-class literary journal.

The independence in politics and criticism which has characterized THE WEEK ever since its first issue will be rigidly maintained; and unceasing efforts will be made to improve its literary character and increase its attractiveness as a journal for the cultured home. Many new and able writers are now, or have promised to become, contributors to its columns, and the constant aim of the Publisher will be to make THE WEEK fully equal to the best literary journals in Britain and the United States.

As heretofore, PROF. GOLDWIN SMITH will, from time to time, contribute articles. London, Paris, Washington and Montreal letters from accomplished correspondents will appear at regular intervals. Special Ottawa Letters will appear during the sessions of Parliament.

THE WEEK being the same size as "Harper's Weekly," is the largest paper of its class on the continent.

SEND FOR FREE SAMPLE COPY.

C. BLACKETT ROBINSON, Publisher,  
5 Jordan St., Toronto, Canada.

## THE AMERICAN GEOLOGIST FOR 1891

AND

## BIEN'S NEW ATLAS OF THE METROPOLITAN DISTRICT,

will be given to New Subscribers to the GEOLOGIST for \$25.00 (which is the regular price of the Atlas alone), if ordered through the GEOLOGIST.

For other premiums see the GEOLOGIST for Nov., Dec., and Jan. Address

THE GEOLOGICAL PUBLISHING COMPANY,  
Minneapolis, Minn.

## THE BOTANICAL GAZETTE.

A monthly illustrated journal of botany in all its departments.

25 cents a number, \$2.50 a year.

Address PUBLISHERS BOTANICAL GAZETTE,  
Crawfordsville, Ind.

Publications of the University of Pennsylvania.

SERIES IN

## Philology, Literature and Archæology.

Vol. I. now ready.

1. Poetic and Verse Criticism of the Reign of Elizabeth. By Felix E. Schelling, A.M., Assistant Professor of English Literature. \$1.00.
2. A Fragment of the Babylonian "Dibbarra" Epic. By Morris Jastrow, Jr., Ph.D., Professor of Arabic. 60 cents.
3. a. *Ilpo*; with the Accusative. b. Note on a Pas, sage in the Antigone. By William A. Lamberton, A.M., Professor of the Greek Language and Literature. 50 cents.
4. The Gambling Games of the Chinese in America. *Fán tán* and *Pák kóp piá*. By Stewart Culin, Secretary of the Museum of Archæology and Palæontology. 40 cents.

In preparation.

The Terrace at Persepolis. By Morton W. Easton, Ph.D., Professor of Comparative Philology.

An Aztec Manuscript. By Daniel G. Brinton, M.D., Professor of American Archæology and Linguistics.

A Monograph on the Tempest. By Horace Howard Furness, Ph.D., LL.D.

Recent Archæological Explorations in New Jersey. By Charles C. Abbott, M.D., Curator of the American Collections.

Archæological Notes in Northern Morocco. By Talcott Williams, A.M., Secretary of the Museum of Egyptian Antiquities.

a. On the Aristotelian Dative. b. On a Passage in Aristotle's Rhetoric. By William A. Lamberton, A.M., Professor of the Greek Language and Literature.

A Hebrew Bowl Inscription. By Morris Jastrow, Jr., Ph.D., Professor of Arabic.

The Life and Writings of George Gascoigne. By Felix E. Schelling, A.M., Assistant Professor of English Literature.

The Papers of this Series, prepared by Professors and others connected with the University of Pennsylvania, will take the form of Monographs on the subjects of Philology, Literature, and Archæology, whereof about 200 or 250 pages will form a volume.

The price to subscribers to the Series will be \$1.50 per volume; to others than subscribers, \$2.00 per volume.

Each Monograph, however, is complete in itself, and will be sold separately.

It is the intention of the University to issue these Monographs from time to time as they shall be prepared.

Each author assumes the responsibility of his own contribution.

N. D. C. HODGES,

47 Lafayette Place, New York, N. Y.

**BOOKS: How to get them.** If there is any Book or pamphlet that you want, write to the Science book Agency, 47 Lafayette Place, New York.

the introduction of the Bessemer process. Professor A. E. Dolbear will contribute an essay on "Metamorphoses in Education." It is a thoughtful paper, and shows that, since education is a process of fitting men for their environment, a change in its character was necessitated by the change in the conditions of human life that has taken place in modern times. "The Rivalry of the Higher Senses" is the title of a paper by Professor G. T. W. Patrick. It points out how greatly we differ from the ancients in receiving most of our information through the eye while they took in theirs more largely through the ear. Some of the consequences of this change are also noted. The second of Professor Frederick Starr's articles on "Dress and Adornment" will be published in the same number. The author maintains that dress arose from a desire for ornament rather than from a sense of shame. He describes a number of beautiful garments that are made by savages, and illustrates his descriptions with a large number of pictures.

Noonday Rock is a pinnacle projecting from the bed of the Pacific off the coast of California. It lies three miles to the westward of North Farallon Island, and is directly in the path of vessels bound to or from the harbor of San Francisco. In order to warn vessels of their proximity to this hidden danger, the light-house establishment keeps a bell buoy over the rock. Sometimes the buoy breaks adrift. There is then great difficulty in finding the rock on account of its small area and great distance from shore. In order to locate it exactly advantage is taken of its being a great feeding place for seals. When the light-house tender is near the spot the steam whistle is blown. The seals rise perpendicularly to the surface of the water, sticking their heads high into the air to find out what the extraordinary noise means. With the surf-boat already lowered, a trial can-buoy can be thrown almost exactly on the rock, thus saving hours of tiresome search.

## Exhaustion

### Horsford's Acid Phosphate.

The phosphates of the system are consumed with every effort, and exhaustion usually indicates a lack of supply. The Acid Phosphate supplies the phosphates, thereby relieving exhaustion, and increasing the capacity for labor. Pleasant to the taste.

Dr. A. N. KROUT, Van Wert, O., says:  
"Decidedly beneficial in nervous exhaustion."

Dr. S. T. NEWMAN, St. Louis, Mo., says:  
"A remedy of great service in many forms of exhaustion."

Descriptive pamphlet free.

Rumford Chemical Works, Providence, R. I.

Beware of Substitutes and Imitations.

**CAUTION.**—Be sure the word "Horsford's" is printed on the label. All others are spurious. Never sold in bulk.

#### POPULAR MANUAL OF VISIBLE SPEECH AND VOCAL PHYSIOLOGY.

For use in Colleges and Normal Schools. Price 50 cents  
Sent free by post by

N. D. C. HODGES, 47 Lafayette Pl., N. Y.

#### PRIZE ESSAYS OF THE AMERICAN PUBLIC HEALTH ASSOCIATION.

Practical Sanitary and Economic Cooking Adapted to Persons of Moderate and Small Means. By MRS. MARY HINMAN ABEL. 12mo, 182 pp. Cloth, 40 cents.

No. 1. Healthy Homes and Foods for the Working-Class. By Professor C. Vaughan, M.D. Ann Arbor, Mich. 8vo, 62 pp. Paper, 10 cents.

No. 2. The Sanitary Conditions and Necessities of School-Houses and School-Life. By D. F. Lincoln, M.D., Boston, Mass. 8vo, 38 pp. 5 cents.

No. 3. Disinfection and Individual Prophylaxis against Infectious Diseases. By George M. Sternberg, M.D., Major and Surgeon U.S.A. 8vo, 40 pp. Paper, 5 cents.

No. 4. The Preventable Causes of Disease, Injury, and Death in American Manufactories and Workshops, and the Best Means and Appliances for Preventing and Avoiding Them. By George H. Ireland, Springfield, Mass. 8vo, 20 pp. Paper, 5 cents.

The four essays (Nos. 1, 2, 3, 4) in one volume of nearly two hundred large octavo pages, thoroughly indexed. Cloth, 50 cents.

N. D. C. HODGES, 47 Lafayette Place, New York.



#### Old and Rare Books.

BACK NUMBERS and complete sets of leading Magazines. Rates low. AM. MAG. EXCHANGE, Schoharie N Y

#### Speech Reading and Articulation Teaching.

By A. MELVILLE BELL.

Price, 25 Cents.

Practical Instructions in the Art of Reading Speech from the Mouth; and in the Art of Teaching Articulation to the Deaf.

[This Work—written at the suggestion of Miss Sarah Fuller, Principal of the Horace Mann School for the Deaf, Boston, Mass.—is, so far as known, the first Treatise published on "Speech Reading."]

From *Principals of Institutions for the Deaf*.

"Admirable in its conciseness, clearness and freedom from technicality."

"The simplicity and perfection of this little book."

"Full of exact and helpful observations."

"A very interesting and valuable work."

"The rules are clearly given and will be of great utility."

"Every articulation teacher should study it."

"A model of clearness and simplicity, without having any of the puzzling symbols that trouble the common mind. . . . The exercises given in speech-reading from the lips are especially interesting, and of great importance for the student of phonetics."

—*Modern Language Notes*.

\* \* \* The above work may be obtained, by order, through any bookseller, or post-free on receipt of price, from

N. D. C. HODGES,

47 Lafayette Place, New York.

#### AMERICAN HERO-MYTHS.

A Study in the Native Religions of the Western Continent.

By D. G. BRINTON, M.D. 8°. \$1.75.

#### THE CRADLE OF THE SEMITES.

By D. G. BRINTON, M.D., and MORRIS JASTROW, JR. Ph.D. 8°. 30 cents.

N. D. C. HODGES, 47 Lafayette Pl., New York.



## DO YOU INTEND TO BUILD?

If you intend to build, it will be a mistake not to send for "SENSIBLE LOW-COST HOUSES," now arranged in three volumes. In them you will find perspective views, floor plans, descriptions, and estimates of cost for 105 tasteful, new designs for houses. They also give prices for complete Working Plans, Details, and Specifications, which enable you to build without delays, mistakes or quarrels with your builder, and which any one can understand. Vol. I. contains 35 copyrighted designs of houses, costing between \$500 and \$1800. Vol. II. contains 35 copyrighted designs, \$1800 to \$3000. Vol. III. contains 35 copyrighted designs, \$3000 to \$9000. Price, by mail, \$1.00 each, or \$3.00 for the set.

"COLONIAL HOUSES," a volume showing Perspectives and Floor Plans of houses arranged in the inimitable style of the Colonial Architecture, and having all modern arrangements for comfort. Price, \$2.00.

"PICTURESQUE HOUSES FOR FOREST AND SHORE":—This shows Perspectives and Floor Plans of new designs for Summer Cottages, which are romantic, convenient, and cheap. Price, \$1.00, by mail.

N. D. C. HODGES, 47 Lafayette Place, New York.



## A NEW MONTHLY THE INTERNATIONAL JOURNAL OF MICROSCOPY AND NATURAL SCIENCE.

THE JOURNAL OF THE  
POSTAL MICROSCOPICAL AND WESLEY  
NATURALISTS' SOCIETIES.

Edited by ALFRED ALLEN and Rev.  
WILLIAM SPIERS.

### CONTENTS OF JULY NUMBER:

Parasitic Fungi Affecting the Higher Animals.  
The Distance of the Stars.  
Infusoria, Protozoa, etc., Practical Methods of Preparation.  
The History of the Microscope.  
Our Young Naturalists' Page—  
A Curious Want of Fear in a Pair of Robins.  
Leap Year.  
Aspect of the Heavens—July, 1891.  
Collectors' Notes for July.  
Natural History Notes.  
The Poison of Toads.  
Effect of Light on Spines.  
Protective Mimicry in Spiders.  
The Phenomenon of Autotomy in Certain Animals.  
Wesley Scientific Society.  
Reviews.

**\$1.75 Per Year.**

To Science subscribers, \$1.00 for one year.

“ “ “ 50 cents for six mos.

Sample Copies 10 cents.

## PSYCHE.

A Journal of Entomology, published monthly by the Cambridge Entomological Club. \$2.00 per year, \$5.00 per volume of three years. Volume VI. began in January, 1891. Back volumes for sale at \$5.00 each. Volume I. sold only in complete sets.

## THE WINNIPEG COUNTRY;

OR,

ROUGHING IT WITH AN ECLIPSE PARTY.

BY

A. ROCHESTER FELLOW.  
(S. H. SCUDDER.)

With thirty-two Illustrations and a Map.  
12°. \$1.50.

“The story is a piquant, good-humored, entertaining narrative of a canoe voyage. A neater, prettier book is seldom seen.”—*Literary World*.

“This is a sprightly narrative of personal incident. The book will be a pleasant reminder to many of rough experiences on a frontier which is rapidly receding.”—*Boston Transcript*.

“The picture of our desolate North-western territory twenty-five years ago, in contrast with its civilized aspect to-day, and the pleasant features of the writer's style, constitute the claims of his little book to present attention.”—*The Dial*.

READY SOON.

## THE LABRADOR COAST.

A Journal of two Summer Cruises to that region; with notes on its early discovery, on the Eskimo, on its physical geography, geology and natural history, together with a bibliography of charts, works and articles relating to the civil and natural history of the Labrador Peninsula.

By ALPHEUS SPRING PACKARD, M.D., Ph.D.  
8°, about 400 pp., \$3.50.

### NEW BOOKS. JUST PUBLISHED FOSSIL RESINS.

This book is the result of an attempt to collect the scattered notices of fossil resins, exclusive of those on amber. The work is of interest also on account of descriptions given of the insects found embedded in these long-preserved exudations from early vegetation.

By CLARENCE LOWN and HENRY BOOTH.  
12°. \$1.

## THE AMERICAN RACE:

By DANIEL G. BRINTON, M.D.

“The book is one of unusual interest and value.”—*Inter Ocean*.

“Dr. Daniel G. Brinton writes as the acknowledged authority of the subject.”—*Philadelphia Press*.

“The work will be of genuine value to all who wish to know the substance of what has been found out about the indigenous Americans.”—*Nature*.

“A masterly discussion, and an example of the successful education of the powers of observation.”—*Philadelphia Ledger*.

Price, postpaid, \$2.

## BY THE SAME AUTHOR. RACES AND PEOPLES.

“The book is good, thoroughly good, and will long remain the best accessible elementary ethnography in our language.”—*The Christian Union*.

“We strongly recommend Dr. Brinton's ‘Races and Peoples’ to both beginners and scholars. We are not aware of any other recent work on the science of which it treats in the English language.”—*Asiatic Quarterly*.

“His book is an excellent one, and we can heartily recommend it as an introductory manual of ethnology.”—*The Monist*.

“A useful and really interesting work, which deserves to be widely read and studied both in Europe and America.”—*Brighton (Eng.) Herald*.

“This volume is most stimulating. It is written with great clearness, so that anybody can understand, and while in some ways, perforce, superficial, grasps very well the complete field of humanity.”—*The New York Times*.

“Dr. Brinton invests his scientific illustrations and measurements with an indescribable charm of narration, so that ‘Races and Peoples,’ avowedly a record of discovered facts, is in reality a strong stimulant to the imagination.”—*Philadelphia Public Ledger*.

“The work is indispensable to the student who requires an intelligent guide to a course of ethnographic reading.”—*Philadelphia Times*.

Price, postpaid, \$1.75.

## THE MODERN MALADY; or, Sufferers from ‘Nerves.’

An introduction to public consideration, from a non-medical point of view, of a condition of ill-health which is increasingly prevalent in all ranks of society. In the first part of this work the author dwells on the errors in our mode of treating Neurasthenia, consequent on the wide ignorance of the subject which still prevails; in the second part, attention is drawn to the principal causes of the malady. The allegory forming the Introduction to Part I. gives a brief history of nervous exhaustion and the modes of treatment which have at various times been thought suitable to this most painful and trying disease.

By CYRIL BENNETT.

12°, 184 pp., \$1.50.

READY SOON.

## THE RADIOMETER.

By DANIEL S. TROY.

This will contain a discussion of the reasons for their action and of the phenomena presented in Crookes' tubes.

## Fact and Theory Papers

### I. THE SUPPRESSION OF CONSUMPTION. By GODFREY W. HAMBLETON, M.D. 12°, 40c.

“The inestimable importance of the subject, the eminence of the author, and the novelty of his work, all combine to render the little treatise worthy of special consideration. . . . We heartily commend Dr. Hambleton's booklet, and wish there were more such works.”—*Editorial, Boston Daily Advertiser*.

“The monograph is interesting in style, scholarly and well worthy of careful consideration. It is devoid of technical expressions, and can be easily read and digested.”—*Pharmaceutical Era*.

### II. THE SOCIETY AND THE “FAD.”

By APPLETON MORGAN, Esq. 12°. 20 cents.

“Mr. Morgan founds a sensible and interesting address upon a text furnished by a sentence from a young ladies' magazine; namely, ‘Browning and Ibsen are the only really dramatic authors of their century.’”—*New York Sun*.

### III. PROTOPLASM AND LIFE. By C. F. COX. 12°. 75 cents.

“To be commended to those who are not specialists.”—*Christian Union*.

“Physicians will enjoy their reading, and find in them much food for thought.”—*St. Louis Medical and Surgical Journal*.

“Mr. Cox reviews the history of his subject with knowledge and skill.”—*Open Court*.

“It is of extreme interest.”—*Medical Age*.

“Worthy of a careful perusal.”—*Indiana Medical Journal*.

“An interesting and popular account of the tendencies of modern biological thought.”—*Popular Science News*.

“All interested in biological questions will find the book fascinating.”—*Pharmaceutical Era*.

“The author displays a very comprehensive grasp of his subject.”—*Public Opinion*.

“Deserves the attention of students of natural science.”—*Critic*.

### IV. THE CHEROKEES IN PRE-COLUMBIAN TIMES. By CYRUS THOMAS. 12°. \$1.

Dr. Thomas has already presented to the public some reasons for believing the Cherokees were mound-builders, but additional evidence bearing on the subject has been obtained. A more careful study of the Delaware tradition respecting the Tallegwi satisfies him that we have in the Bark Record (Walam Olum) itself proof that they were Cherokees. He thinks the mounds enable us to trace back their line of migration even beyond their residence in Ohio to the western bank of the Mississippi. The object is therefore threefold: 1. An illustration of the reverse method of dealing with prehistoric subjects; 2. Incidental proof that some of the Indians were mound-builders; 3. A study of a single tribe in the light of the mound testimony. This work will be an important contribution to the literature of the Columbian discovery which will doubtless appear during the coming two years.

“A valuable contribution to the question, ‘Who were the mound-builders?’”—*New York Times*.

“Professor Cyrus Thomas undertakes to trace back the evidences of a single Indian tribe into the prehistoric or mound-building age.”—*N. Y. Sun*.

“An interesting paper.”—*Christian Union*.

### V. THE TORNADO. By H. A. HAZEN. 12°. \$1.

“The little book is extremely interesting.”—*Boston Transcript*.

“A book which will find many readers. The chapter on ‘Tornado Insurance’ is of interest to all property-holders in the tornado States.”—*Boston Herald*.

“‘The Tornado’ is a popular treatise on an important province of meteorology, in which science, the author, Professor Hazen of the United States Signal Service, may be regarded as an expert.”—*Philadelphia Ledger*.

### VI. TIME-RELATIONS OF MENTAL PHENOMENA. By JOSEPH JASTROW. 12°. 50c.

“All students of psychology will find the book full of interesting facts. Professor Jastrow's good qualities as a thinker and as a writer are too well and too widely known to require comment.”—*Public Opinion*.

“A useful work for psychologists—as well as the general reader—by setting forth in brief and easily intelligible form the present state of knowledge in regard to the time required for the performance of mental acts.”—*The Critic*.

### VII. HOUSEHOLD HYGIENE. By MARY TAYLOR BISSELL. 12°. 75 cents.

“A sensible brochure.”—*Brooklyn Eagle*.

“Practical and sensible.”—*Public Opinion*.

“The advice and excellent information which it contains are tersely and intelligently expressed.”—*Boston Medical and Surgical Journal*.

“Practical and simply written.”—*Springfield Republican*.

“The best monograph on home hygiene.”—*St. Louis Globe-Democrat*.

In Preparation.

### VIII. THE FIRST YEAR OF CHILDHOOD. By J. MARK BALDWIN.

N. D. C. HODGES, 47 Lafayette Place, New York.